Innovation for Regional Communities: A Research Framework

Jerry Courvisanos

Centre for Regional Innovation and Competitiveness (CRIC)
School of Business
University of Ballarat,
P.O. Box 663, Ballarat,
Victoria, 3353 Australia
Facsimile 03-5327 9405
e-mail: j.courvisanos@ballarat.edu.au

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Abstract

The paper outlines a research framework that can serve as a guide to regional research. This is an inter-disciplinary framework allowing all researchers from any discipline to focus on the regional problematic with the objective of serving a regional community.

No research can begin without a perspective on the broad issue for study and deliberation. This presentation begins with the "vulnerability/inability" problematic of the domestic regional (non-urban) situation and the innovation strategy required in addressing the factors underlying this problematic. The framework around this problematic-strategy dimension is an economic model by Michał Kalecki, augmented by the work of evolutionary-based innovation researchers and resource-based firm analysts. From this framework emerge implications for public and private sector strategic decision-making, and the types of innovation in regional communities that need to be developed. The concept of "regional competitive strengths" is identified as the essential element in any regional innovation strategy that attempts to generate long-term competitiveness and ensure regional rejuvenation and sustainability.

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Regional Innovation: An Introduction

The regional perspective in this paper refers to people living beyond metropolitan and major urban centres. This perspective began to significantly alter in all industrialised countries from the beginning of the 1990s, from seeing regions as some homogenous distant and less advantaged areas, to independent and significant contributors towards their own identities. Evidence of this altered perspective exists in both the private and public sectors. In the private sector, firms have recognised the need to relate and adapt to the local community, to the extent that even globally-based firms have begun to develop a local identity (often called 'glocalisation', see Chell, 2001, pp. 27-51). Similarly, government regional policies have reduced their emphasis on ameliorating inequalities and developed support systems to encourage regional diversity and enterprise (Hassink, 2002).

The role of innovation in providing diversity and enterprise for this altered regional perspective has been developed strongly by researchers from many disciplines and organisations. Innovation, in terms of creative technological knowledge, has always been recognised as a key driver of economic growth and community development. Initially, neoclassical economists identified this innovation driver at a national level. However, their perfect knowledge assumptions resulted in conclusions about immediate diffusion of innovation with some barriers at national boundaries (e.g. Solow, 1957). This denied any effective role for regional analysis. The regional context in economic analysis began with Kaldor (1970) in which there was no knowledge diffusion, with innovations limited to specific clusters of economic activity. This was the first non-neoclassical approach to regional economic analysis, and was quickly followed by the works of Richardson (1973, 1978a). Attempts by neoclassical economists to adjust their models to account for regional realities have been constrained because of their own inappropriate methodology.[1] Modifications to perfect knowledge diffusion only led to arguments of how long it would take for a nation or region to "catch-up", rather than examining the specific environment for innovation.

At an international level since the late 1990s a large expansion of research on regional innovation has centred on systems operating in the specific spatial environment. Systems of innovation relate to a holistic analysis of the complex array of processes that determine the knowledge base and decision-making that affects innovation. It has been a multi-disciplinary and cross-country field of study as researchers attempt to identify systematic patterns that result in clusters of knowledge-based innovative activity (Cooke, 2001). This new research field has been given much institutional respectability with the recent large OECD cross-country study of clustering in innovation (OECD, 1999).

[1] Richardson (1978b, p. 143) describes the neoclassical attempt at regional analysis in the following way:

> Although the neo-classical model may be modified or manipulated to provide a reasonable replication of the regional growth process, the spatial aspects of regional analysis reveal the limitation of the basic neo-classical model. The neo-classical growth analyst may choose to remain faithful to his traditional methodology, but alternative frameworks can more easily cope with the complication of space.

A literature search on Australian regional innovation systems (ARIS) has uncovered one theoretical work by Whetton (2001) on what he calls "Innovative Milieus". Two studies of innovation in the Illawarra region (Hodgkingson, 1998; Mohannak and Aylward, 2002) provide excellent case analysis. John Martin has begun to analyse the local government angle on ARIS (see Martin, 2001 and Martin et al., 2002) and Kenyon and Black (2001) looked at small town renewal with the support of nascent regional development agencies of State and Federal governments. Pioneering Australian clustering research by Marceau (1999) has rural applications, while the specific regional clustering work surveyed in Beer et al. (2003, pp. 136-42) indicates a growing attention to this important aspect of the ARIS.[2] Finally, Beer et al. (2003) provide two important discussions related to regional innovation in their recent book without anchoring their analyses to the ARIS: an outline of sunrise industries (pp. 107-42) and an entrepreneurial model of economic development which they regard as the compromise solution between two unacceptable scenarios of unfettered capitalism and centralised planning (pp. 257-60).

This paper aims to establish a research framework that can place the international literature on research innovation systems into the Australian context. This requires an appropriate non-neoclassical economic model with the work of evolutionary and institutional based researchers and geographical case studies. Within this framework the rural and non-capital city periphery in Australia needs to be identified as an important specific aspect of regional innovation that creates large disparities in income levels and life opportunities. The research framework developed in this paper would be able to provide a basis for more intensive and coherent analyses on regional innovation.

The paper begins with an outline of the major factors identified in the international literature that affect the regional perspective. A non-neoclassical economic model underlying the regional innovation problematic and a planning strategy to address this problematic is then set out. Specific public and private sector strategies follow, with the aim of developing regional competitive strengths. Finally, the paper suggests what needs to be done in Australia to address the issues raised, especially in context of what European countries have successfully achieved. The role of research embedded in this action plan is the *raison d'être* for the framework developed.

The Regional Perspective for Innovation: Evolutionary Concepts

Source of the problem: Research requires a perspective as the basis for investigation. Regional innovation research needs to address the basic regional problematic of adjustment in the periphery to rapid structural change that originates from the core of economic activity in major urban centres both in Australia and overseas. The latest in revolutionary structural change is the development of the knowledge-based information technology paradigm (Freeman and Perez, 1988). Adjustment to this paradigm change has created a specific set of problems for rural and regional Australia that have been well recognised and documented.[3]

[2] Regional clustering of innovative activity is the aspect that concerns this paper (Acs, 2002, p. 191). Regional clusters in Australia can be conservative or ineffective, thus not contributing to the ARIS. For example, this has been an ongoing problem with Tasmania as a region (Courvisanos, 1999).

[3] Gray and Lawrence (2001) and Pritchard and McManus (2000) provide excellent detailed expositions of the Regional Australian problematic.

Problem identification: The regional situation emerging from the structural change problematic has been a heightened state of vulnerability for regions that have suffered significant decline and for regions that have had to cope with unmanageably rapid growth. Regions in decay have experienced large unemployment, low income levels, lack of public services, diminishing private sector facilities, and growing isolationism (Courvisanos, 2001). Regions with large population growth spurts experience severe constraints in respect to provision of adequate public facilities (especially public transport), demand pressure on local resources (e.g. land, labour) and social cohesion between established culture and the new residents' values (Wahlquist, 1998).

Innovative solution: From regional vulnerability, analysts need to work out the precise requirements that can rejuvenate regions in decay and sustain regions under severe growth pressures. This is where innovation is needed to develop appropriate creative solutions to manage and ameliorate the specific vulnerable problems identified in the each region. Landabaso (2000, p. 80) outlines the "regional innovation paradox" that afflicts peripheral and vulnerable regions by observing that:

> …the more innovation is needed in less favoured regions to maintain and increase the competitive position of their firms in a progressively global economy, the more difficult it is to invest effectively and therefore 'absorb' public funds for the promotion of innovation in these regions.

The underdevelopment and fragmentation existing in vulnerable regions makes innovation systems relatively weak and ineffective. Such regions require specific cultural and institutional changes that will allow interactive learning to bring forward innovative solutions to meet local needs for overcoming vulnerability.

Project planning and management: A regional strategy must be put into place once the requirements are identified and appropriately adapted to the local needs. A plan must be forged that aims to develop embryonic competitive strengths that provide transition from vulnerability to sustainability. "Competitive strengths" (CS) is a dynamic term that refers to innovative activity that develops into some form of competitive advantage (Richardson and McCombie, 1987). An embryonic regional CS is the creative potential that emerges out of regional innovation, providing the project(s) that are planned and then implemented in the context of specific regional cultures and institutions.

Regional research focus: A research framework needs to be developed to assist in this strategic innovation approach from problem identification to creative solution and then planned implementation. This paper provides an attempt at such a research framework that can be used as the basis for research grants, research inquires and consultancy requests from local communities.

There has been a large body of research that has formulated a series of theoretical concepts used effectively in the understanding of regional differences in innovation.[4] These concepts can now be used to develop processes required for a regional innovation plan. Five concepts are set out below which encapsulate the essence of the regional innovation perspective. Leading researchers responsible for developing each concept are identified and referenced.

[4] This research has been conducted from an evolutionary perspective within a regional context.

1. Space – This is the prime element of the regional perspective, however it has be broadened to not only include normal physical space in the periphery, but also mental space and cyberspace as peripheral nodes of activity. This is in juxtaposition to the core space occupied by non-regional locations with central nodes of activity. Many of these centres are global and infiltrate through major metropolitan centres, as well as occupying central mental space (globalised neoliberal ideology) and cyberspace (information rich producers and consumers of Information Technology). Paul Krugman is the leading advocate of geographical (physical) space determining the technology clusters in large urban regions (Krugman, 1991). Recent work on neural networks provides the basis for analysing mental and cyberspace (e.g. Nilsson, 1998).

2. Cumulative causation – Nicholas Kaldor specified the principle of cumulative causation as "increasing returns to scale in processing activities" (Kaldor, 1970, p. 340). This occurs due to new technology (innovation) remaining in specific locations with no knowledge diffusion. The resulting clusters create a build-up of returns on technological progress that then develop positive feedback onto the original process, cumulating further locational advantage to the original innovation. Researchers since Kaldor have applied this cumulative causation principle with more realistic assumptions of imperfect mobility and slow knowledge-based diffusion of technology (see Caniëls, 1999). This process works on the basis of interactive learning that cumulates over time.

3. Spillovers – Innovation diffuses over space through the process of knowledge spillovers that operate at different rates of diffusion across technology gaps. Factors that affect the extent of spillovers (and thus the rate of technological diffusion) in specific locations are population density, geographical proximity, knowledge mobility and electronic connectivity. Siebert (1969) was the first to identify diffusion over space, this has been followed by many researchers, notably Audretsch (see Audretsch and Feldman, 1996) and Rogers (1995).

4. Evolution – Innovation over historical time is the basis of dynamic change that creates fundamental uncertainty. Organisations need to develop behavioural patterns and habits called "routines", in order to make decisions on future actions. These routines are based on a repertoire of skills that evolve over the life-cycle of the organisation as learning and selection occur. This central dynamic to innovation needs to be grounded in an economic framework that allows for evolutionary change, something that neo-classical economics can not provide. The seminal economics work in evolutionary theory is Nelson and Winter (1982), while the first regional (or geographic) evolutionary perspective came from Allen and Sanglier (1978). Arthur (1990) linked the geographic perspective to the time path-dependence set up by economic-based routines.

5. Regional Innovation Systems (RIS) – An innovation system is a physical, mental or cyberspace environment in which the above four concepts operate as an overall supportive (or unsupportive) system. Systems approach to innovation enables a conceptual framework to be developed that has an institutional setting covering all aspects of the innovation process in a historically determined dynamic. The concept of a national based innovation system was simultaneously proposed by Freeman, Lundvall and Nelson; all in the same book of readings (Dosi et al., 1988). A sub-national level of innovation systems began to be identified through case studies in the

early 1990s (Davis, 1991; Cooke and Morgan, 1994; Saxenian, 1994). The theoretical underpinnings of RIS began to be developed in the late 1990s (e.g. Porter 1988; Hamel, 1999), and only since the turn of this new century has the international research in this area exploded (see Acs, 2002).

The five concepts together concentrate innovation in specific spaces to create increasing returns to location. This occurs because in specific sub-national spaces, knowledge spillovers, both internal and external to each organisation, create cumulative learning that establishes a set of evolving routines. The impact on regional development will vary depending on the extent and depth of the innovation systems within a specific region. Since the effects of knowledge spillovers are seen to diminish with distance, this provides a key motivation for organisations to agglomerate, strengthening the established RIS. Thus disparities in regions can be seen to stem from different regional innovation systems that organisations work under, and through their own innovative activities these organisations also contribute back to their own innovation systems

Regional Innovation: Kaleckian Principles

The literature on regional innovation has not been grounded in an economic model of the economy that is compatible with the regional problematic and the five regional concepts. A non-neoclassical economic framework using the work of Polish economist Michał Kalecki is here developed with the objective of innovation playing a critical dynamic role. Kaleckian economics is based on the central role of capital accumulation (or investment) as it drives the business cycle over the short-run, while creating long-run trends that determine the growth and development of a specified region. Capital accumulation is embedded in the endogenous (or induced) innovation generated from within the organisations (*via* research and development [R&D] expenditure, and knowledge spillovers). Kalecki (1991, p. 327) identifies this "innovation effect" as a "development factor" which creates the following dynamic process:

> …innovations prevent the system from settling to a static position and engender a long-run upward trend. The accumulation of capital, which results from the fact that long-run investment is above the depreciation level, in turn increases the scope of the influence of the development factors and thus contributes to the maintenance of the long-run trend.

Kalecki, then, sees "exogenous" innovation as representing the intensity of innovation with given capital investment levels. This means that any change in the intensity of the innovation effect originates in the invention or basic business opportunity identified as the source of the innovation. So that a:

> …reduction in the intensity of innovations…will also initially cause a disturbance in the cyclical fluctuation and, by means of a slump more pronounced than the boom, will make for a lower long-run level of investment. (Kalecki, 1991, p. 328)

This would lower the long-run trend, where an increase in innovation intensity would raise the long-run trend in economic growth.

The first Kaleckian principle of innovation derived from the above analysis is that induced and exogenous innovation, together create the transition of an economic region from static-state to long-run upward development. The process that generates this transition is capital accumulation embedded with innovation. This then brings us

to the second Kaleckian principle that historically determined profit levels generate the ability to invest in capital goods and in innovation knowledge enhancement (Kalecki, 1991, p. 283). Profits (or surpluses in non-profit organisations and public authorities) not only provide the wherewithal to invest, but also through their extension of the capital funds owned by the organisation ("entrepreneurial capital"), it also allows for access to loans and share issues ("rentier capital"), which can further extend capital and knowledge-based investment (Kalecki, 1991, p. 279).

The third Kaleckian principle relates to the two applications of innovation. One is co-ordinated through mass production systems in large organisations, and is related to Schumpeter's Mark II innovation mode through large corporations (especially large R&D budgets). The other application is in new small-scale developments across diverse areas of activity, and is related to Schumpeter's Mark I innovation mode through new small entrepreneurs (Kalecki and Szeworski, 1991, p. 376).[5] Both applications increase capital accumulation, but have different structural implications. Evidence from the USA shows that large firms have a response to innovative activity, with respect to in-house R&D investment, that is more than two times greater than their response to expenditures on university research. Also, large firms' innovative activity response rate is nearly twice as large as small-firms' innovative response to in-house R&D. On the other hand, the same empirical studies show that small firms' response to innovative activity with respect to university research is about 50 per cent greater than for large firms (Acs, 2002, p. 25). This means that the application of innovation depends on the existing RIS; large firms with R&D budgets, university research base including technology parks, or small and large firms isolated from any form of research endeavours. Each regional form has different implications for successful regional innovation, and requires appropriate public policy actions and compatible private sector strategies.

The fourth Kaleckian principle is on the tendency for non-metropolitan regions to suffer disadvantages of innovation. Generally weak RIS exist in such regional centres as large firms controlled by powerful "monopoly capital" tend to keep their R&D in central urban locations, often with multinational companies this tends to be in home-based centres overseas. Such weak RIS then experience negative cumulative causation resulting from income distribution shift from wages to monopoly capital profits, reducing the role of profits in stimulating investment in capital goods and innovation in regional centres, and lowering wages which provide less effective demand as incentive to supply regional markets.[6] This leads to continued dependence on traditional commodities that are mature products and are much less liable to innovate.[7]

The Regional Innovation Problematic and Future Planning Vision

Combining the Kaleckian principles and the evolutionary concepts, the crucial elements of the regional problematic can be clearly identified. This will provide the basis for a planning vision for regional innovation to be used for researching specific regional issues and their possible solutions.

Seven elements of the potential regional problematic are set out below:

[5] On Schumpeter's two forms of innovation see Malerba and Orsenigo (1993).
[6] This regional disadvantage perspective is based on Kalecki and Szeworski (1991, p. 376).
[7] Isolated regions like Tasmania exhibit Kalecki's fourth principle (Courvisanos, 1999).

1. "Lock-in" with traditional industries: Once on a particular technological path, it is extremely difficult to change direction given the RIS in place.
2. Weak learning capabilities: Ability for knowledge-sharing and competence-building is hindered in regions by factors like atomistic behaviour, limited worldview, apathy towards assimilation and coordination of knowledge.
3. Low density of institutions: This prevents enough concentration of crucial elements required to develop effective clusters.
4. Fragmented systems: Small groupings that are diverse and spread widely lack consolidation into strong systems of innovation.
5. Low skill base and poor mobility in labour: Tyranny of distance and commitment to place can limit ability for labour to develop a more experienced outlook.
6. Large technology gaps: Knowledge spillovers are very limited when regional disadvantages abound, creating isolated small technological systems that do not reach critical mass.
7. Low intensity of innovation: Dependence on small firms without the symbiotic links with large firms, leaves innovation intensity in the hands of public sector constructed research bases of universities or agricultural and scientific research units (e.g. CSIRO). Such public resources are being heavily constrained by current government budget constraints.

Australian regional innovation research needs to examine regions in the context of the above seven elements of the regional problematic to identify if these problems do in fact exist and their extent. Any of these elements may affect different regions in extremely divergent ways. Thus, low innovation intensity manifests itself differently in a region under pressure by massive holiday and retirement development to another region which has high unemployment with massive emigration from the area, leaving only the low income aged behind. Once these specific problems are identified, the next step in the research agenda is to formulate a prescriptive planning strategy that would be available for both the public and private sectors to build on the region's embryonic competitive strengths (CS) towards sustainable development.

Adolph Lowe established an analytical framework designed to create a vision with possible scenario planning routes in the context of specified problems and identified strengths. Forstater (1999) outlines the "policy discovery procedure" which Lowe's analysis entails. It is a regressive procedure, beginning from the future visionary state developed from a pre-analytical exercise (e.g. SWOT or Search models) and working backwards to the present state. This working backwards Lowe labels as "instrumental analysis", which has rules of formal logic to be applied to cause-and-effect sequences over real historical time. This framework is particularly aimed at using such cause-effect principles to set up strategies for sustainable and equitable economic growth. Lowe calls this "...the search for the economic means suitable for the attainment of any stipulated end. To this procedure I have assigned the label of instrumental analysis." (Lowe, 1976, pp. 11-12) The procedural essence of this instrumental analysis (IA) is to initially identify the objective(s) and then to design causal means consistent with achieving the objective(s). The IA process is cumulative with altering perspective, aiming to generate effects envisioned using means that are revealed over time as practice produces results that can be compared to the objective(s).

The analytical IA process should be applied to the regional problematic through two specific research **methods**: (i) Regressive inference to derive necessary links back to the identified motivational patterns of firms and other organisations in the region. (ii) Develop "secondary controls" which alter behaviour to enable the region to reach generally accepted goal-adequate paths to the vision. Three general research **strategies** are needed: (a) Establish the human agency elements inherent in all private decision-making. (b) Secure the co-operation ("voluntary conformity") of entrepreneurs and all other agents involved in the regional planning process (e.g. university technology centre, state bureaucracy, union/employee delegates, training schools) to alter behaviour towards a more sustainable path. (c) Introduce into this path, diffusion of a complex array of processes for the new innovation system to reach specified and accepted goals. These strategies can be implemented using a perspective planning approach. This approach requires long-term strategies to be based on specific short-term goals that eventually add up to the long-term goals specified. The plan is continually assessed at every short-term end-point to see whether it is necessary to revise the goals and the strategy of reaching them (see Kalecki, 1986).

"Secondary controls" are the specific public policies introduced to achieve the desired strategy.[8] These controls need to have the following conditions -

- dynamic (specified over a nominated period of time) and operating directly on motivations and their impact on market behaviour.
- sufficiently large economies of scale exist to generate benefits from modern technology and management skills.
- expectations are constrained by the generally accepted choice of macroeconomic goals (employment growth, unemployment rate, inflation rate, external balance).
- microeconomic action directives (e.g. R&D incentives) relate to specific plans need to be consistent with agreed macroeconomic goals.

All secondary controls must have two elements. The first are technical engineering rules that govern the path of development given the current technological limits. The second are motivational substructures based on agreed microeconomic goals. These two elements enable planning decisions to be made with minimum exposure to market failures of financial over-commitment, information inequity and large profit volatility.

The regressive procedure based on Lowe's methods and strategies outlined above form the research analytical content of any regional innovation plan. This instrumental analysis allows a community, using "bottom-up network dynamics" (Acs, 2002, pp. 172-4), to take a SWOT-type pre-analytic vision into a coherent regional strategy which is endorsed and supported by the appropriate public and private organisations. Too many times major successful searches for visions have floundered on the inability or inadequateness of the community to take the vision into a concrete reality. Instrumental analysis with perspective planning provides the community with an effective way to implement the vision.

Public Policy Implications

This section specifies how public regional planning using instrumental analysis can bring forward innovation as the major source of regional development. This requires

[8] Lowe applies the term *primary controls* to orthodox macroeconomic demand management policies (see Oakley, 1997, pp. 17-18). Such public policies will not, *on their own*, deliver the appropriate goal-adequate paths due to microeconomic market failures inherent in investment instability.

public policy-makers to alter their approach from being a regulator and innovation sponsor to an "enabling actor and catalyst" in implementing this regional plan (Kemp et al., 1998). Extensive research is required for each specific region to develop the most appropriate and effective ways of implementing the following public policy actions:

1. Identify existing and potential regional CS within the specified locality or space in the periphery of a larger economic entity. These CS must be leader activities in wealth-generation that would service outside the local region (follower activities which merely service the region itself are not CS). Gold discovery in Ballarat in the 1850s is a historical example of a regional CS in the immediate region of my university.
2. Establish efficient knowledge infrastructure (e.g. information technology) to allow the regional CS to develop.
3. Facilitate knowledge spillovers from technology parks, universities, TAFE, schools, medical centres, business incubators, enterprise centres and other public institutions that allow small private regional enterprises to develop with strong new networks.
4. Provide incentives and training facilities that stimulate private sector R&D activities, especially from large firms attracted by the regional CS.
5. Ensure leader activities are effectively made "footsure", thus locking firms into the place as part of the region's culture and institutions.[9]
6. Adjust routines or customs in the region (e.g. festivals, expos, charity work, arts and music events) to reflect the new rising CS, rather than locking-in to conservative and traditional modes of operation.
7. Ensure availability of financial mechanisms that can support new venture creations without the demands for track record that circumvent many regional innovations (e.g. public issue for locals into a new innovation; see for example Safe, 2003).

The above seven points need to be formalised in collective bottom-up planning strategies that have a demand-led approach to the instrumental analysis. Initial effective demand must create the basis for an interactive regional innovation policy involving much trial-and-error research with localised perspective planning. New institutions to implement this strategy must be both firm-based (e.g. incubators, technology parks, and innovation management training schemes) and regional-based (e.g. clusters, local strategy plans, innovation brokers). Examples of peripheral regions overseas that have been successful in this approach are in Québec, Canada (Doloreux, 2003); Lund, Sweden (Jonsson, 2002); and regions in The Netherlands (Nauwelaers and Wintjes, 1999).

Private Sector Strategic Implications

The private sector needs to respond to the collective bottom-up planning developed through the instrumental analysis. This in itself is a challenge for it requires businesses to be proactively innovative towards the emerging market opportunities created by the combination of community vision and public regional planning. In this situation present and potential entrepreneurs need to understand the direction of effective demand and develop products, processes, services and knowledge-based

[9] "Footloose" firms are liable to relocate to another region if what keeps them in the region are not long-term regional CS, but ephemeral financial offers (e.g. local rate exemptions for two years) and exploitation of cheap resources (e.g. low unskilled labour).

activities that meet this new market demand. Research by consultants, R&D companies, chambers of commerce, regional development boards and area consultative committees have to assist in the transition from "traditional" to "new" economic region.

Specifically such private sector-based research should work within the identified CS in the region to innovatively respond to the community's vision. Entrepreneurs need to dovetail their creative problem-solving skills towards areas and approaches developed in the private-sector research and supported by public policy actions in place. Success in this approach depends on the extent of technological "embeddedness", or the degree to which the innovations are rooted in the new institutions of the RIS. A technological and institutional trajectory needs to materialise from the regional plan that ensures this technological embeddedness.[10] The trajectory needs to exhibit learning economies of scale through encouraging knowledge-sharing. The establishment of Mechanics Institutes in the late 19th Century throughout Australian regional communities shows how learning about new technologies is a practical and acceptable process. All successful technological trajectories need to have strategies for setting up (e.g. business incubators) and then scaling up as demand expands (e.g. technology parks).

There are specific business management strategies that the private sector (both profit and non-profit) can use to implement the innovation processes in the regions. Strategic niche management (SNM) is a technique widely recognised as expediting the private sector transition to a new technological regime. SNM is

> …the creation, development and controlled phase-out of protected spaces for the development and use of promising technologies by means of experimentation, with the aim of (1) learning about the desirability of the new technology and (2) enhancing the further development and the rate of application of the new technology. (Kemp et al., 1998, p.186)

With public policy enabling the process, the private sector can lead the innovation process of articulating the new technologies within new institutional systems. Smaller geographically bounded spaces that exist in regional Australia provide effective ways of articulation. Successful examples in Europe of such SNM regions provide case study research material to develop SNM projects in regional Australia.[11]

Large firms who currently exist or want to enter a non-metropolitan region can develop their own unique innovative regional development aspect through forming joint ventures or strategic alliances across and within regions. Regional planning research needs to find ways to attract and sustain such collaborations because they have the potential of creating critical mass in a much shorter time than with embryonic SNM projects. For small and medium sized firms industry clustering and networking provide another avenue for innovative activity to be generated within a regional plan context. The seven point public policy strategy above can be the basis for successful private sector collaborations for both large and small firms. The most exciting developments in RIS are how the synergies between large and small firms are

[10] On this technological embeddedness, see Tidd et al. (2001, pp. 320-1) for a business management perspective and Dosi (1988) for an economics perspective.

[11] Kemp et al. (1998) provides one such example with the introduction of electric vehicles in The Netherlands.

creating strong effective innovative processes towards regional development. This type of synergy allows the R&D and network strengths of large firms to be linked with the more flexible and creative elements of small innovative firms (Tidd et al., 2001, pp. 349-70).

Social entrepreneurial clustering is a new term for the development of non-profit small enterprises with strong local based networking (Botsman, 2003). There are many examples of regional social entrepreneurial clustering formed over the previous century in country towns right around Australia, e.g. farmer agricultural co-operatives, parish St. Vincent de Paul shops, and third world aid gift emporiums. These activities were built around a system of enterprise that is no longer sustainable due the regional problematic outlined earlier. Now there needs to be a transition to a new economic base, and these same elements of social entrepreneurship can provide a strong bond of shared learning networks that can engender a sustainable regional community with a broader diverse range of skills and creativity than currently existing. Research on the past social entrepreneurial clusters and options for the future can help to develop this process from the basis of the past.

Finally, recent research from the Illawarra region has uncovered strong vertical industry cooperation between suppliers and customers, and that this linkage has provided a more effective innovative spur than any horizontal partnerships with research institutions and universities (Mohannak and Aylward, 2002). This indicates two things. First, the absolute need for regional public instrumental policy as a catalyst for horizontal networking as described directly above. Second, the need to also husband the value chain management (VCM) technique underlying this vertical networking, for it is this approach that develops the strong effective demand based on market collaboration rather than some atomistic notions of market competitiveness. Further research along the lines of the pioneering work of Mohannak and Aylward should provide basis for more effective private sector strategies and enabling public policies.

What is to be done?

This paper sets out an agenda for research which attempts to provide for the development of a regional plan by an enabling public sector and its regional constituents that allows an entrepreneurial private sector to prosper. In the first instance any regional perspective needs to focus on the appropriate forms of innovation for each region on a case-by-case basis. This investigation needs to identify the specific regional problematic, engage the whole community in an instrumental analysis to develop an effective regional plan and instigate processes that will allow the private sector entrepreneurs to engage with the plan and its constituents.

Regional innovation perspectives can be identified for different types of strategies. These perspectives are based on the innovation literature and can be arbitrarily split into three:

1. The paradigm-shift (or transformational) perspective involves major shift in the technological and institutional structures in the regional innovation system (RIS) to take advantage of identified competitive strengths (CS). In this perspective there is need for major strategies using large public infrastructure spending, attract “leading edge” organisations into the region and strong

strategic niche management (SNM) techniques for the market, particularly for new demand outside the region.

2. The radical perspective involves significant shift towards identified CS, but building upon the current regional systems in place. In this perspective there is need to foster clustering and networking that already exists with strategy plans that incorporate technology parks with synergies between large and small firms; joint ventures by established firms; and State "anchor clients" that provide a strong demand for footsure CS activities.

3. The incremental perspective involves important but subtle shifts towards regional CS that potentially or actually exist. This perspective should use the significant RIS that already exists but requires public policy support rather than an enabling function. The need to foster incremental innovation comes from identifying breakdowns or possible improvements in the value producing sectors along the value added chain. This value chain management technique should implement strategies to move along the appropriate innovation path by adjusting routines, improving financial support, developing incubators and forming alliances.

In all three perspectives it is crucial that infrastructure and opportunities are created for local-based organisations to exploit the innovation policy established.

A research framework that embeds the innovation process into the region from one of the three perspectives must be formed. The elements of this framework are:

i. Identify innovative CS and the innovation perspective in the region.
ii. Form an interactive bottom-up regional innovation plan via instrumental analysis.
iii. Develop public infrastructure in the RIS that is consistent with plan.
iv. Create effective private investment in competitive strength-type activities through innovation strategies and techniques.
v. Entice collaboration between public and private sector for the region to "take-off" (e.g. public anchor client).

This research activity needs to be undertaken by a variety of researchers at different levels of analysis from different, but interlinked, organisations. Academic researchers need to analyse the past and present regional problems and develop frameworks and strategies for future problem resolutions. Governments need to research and implement the enabling process for regional innovation. Consultants need to provide support for innovative private (profit and non-profit) organisations to create or restructure new systems and processes. Government departments at the Federal and State levels have led the way in establishing regional innovation incentives and enabling processes (e.g. Federal *Backing Australia's Ability*, and the Victorian Department of Innovation, Industry and Regional Development). They need to go further and articulate instrumental analysis to have innovation embedded in regions that suffer from economic vulnerability. A vision has been produced by The Regional Australia Summit in October 1999 set up by the Federal Government, but no clear instrumental analysis has been developed to make this vision a reality. Regional development boards and business groups need to encourage research and practice in line with new regional visions. Consultants like the Australian Centre of Innovation and International Competitiveness are now establishing in this area.

Finally the research to develop and deepen this regional innovation from academic researchers needs to be more programmatic along the framework suggested in this paper. An example of how such a research program could be attempted is outlined in the landscape table at the end of this paper. This is a proposal for investigating the Central Highlands region of Victoria. The academic infrastructure is coming into place, with many research centres beginning to focus on the area of regional innovation. University of Ballarat has the Centre for Regional Innovation and Competitiveness (CRIC), University of Wollongong has the Centre for Research Policy and Innovation Studies (CRPIS), University of Western Australia has the Centre for Entrepreneurial Management and Innovation (CMI) with a research theme in Regional Innovation and Enterprise. A Federal Government supported partnership between the University of Queensland and the University of Melbourne in establishing the Centre for Rural and Regional Innovation has recently been established. The research developing from these centres need to form a cluster of its own so that the level of analysis can become consistent and supportive in the way that European regional innovation has created a strong cluster of institutions and researchers.

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Approach: Five-step investigation into structures, problems and strategies based on the research framework developed in SEGRA 2003 conference paper by Courvisanos. Table below specifies the five chronological steps for the Central Highlands (C.H.) project.

Investigation	Theory/Concepts	Data Sources	Research Outcomes	Community Outcomes
1. Describe the regional innovation situation: - extent of a system, or none at all - state of innovation systems (e.g. clusters, large co. R&D, value chain links, patent activity, educational institutions) - extent of knowledge infrastructure - identify system gaps and breakdowns	Evolutionary concepts (Caniëls, 1999) Kaleckian principles (Kalecki & Szeworski, 1991) *Regional innovation systems* (Acs, 2002; Cooke, 2001)	Available data from linkage partners and other regional profile material (including ABS data).	Method of describing a regional innovation situation within the Australian culture	Brochure for C.H.community outlining the regional innovation situation (RIS)
2. Identify existing and potential competitive strengths (CS) leading to specific competitive advantages for innovation in the region	*Competitive strengths and advantage* (Richardson & McCombie, 1987)	Analysis of regional data from step one.	Significant new CS analysis and application	Report to focus groups, etc.
3. Articulate vision for regional development	*Problem-solving processes* (Proctor, 1999)	Focus groups Search models SWOT analysis	Action research base to vision grounded in RIS	Specified vision on innovation
4. Analyse possible scenarios to reach identified vision	*Instrumental analysis (IA)* (Forstater, 1999)	Combination of 2 and 3 above	Breakthrough application of IA to strategy	Choice of scenarios for C.H.community
5. Specify processes, actions, strategies to implement scenarios - motivational links (knowledge-sharing, strategic niches, clusters, synergies) - technical rules (routines, conventions, rules-of-thumb) - public policies (infrastructure, enabling processes, support, incentives, lock-in leaders)	*Regional innovation policies and strategies in the periphery* (Doloreux, 2003; Whetton, 2001)	Report to, and feedback from, linkage partners and their constituent bodies and organizations	Develop strong coherent approach to policies, actions and strategies across any community as a whole	Specific approach to implement a strong and sustainable C.H. innovation system